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To study the relationships among figural creativity, intelligence, and personality, 196 fourth, fifth, and sixth grade boys and girls were given a battery of 14 tests. Teacher ratings of creativity and independence, grade point averages, art grades, and IQ scores were also obtained. It was hypothesized that a unitary trait of "creativity" could be measured. Statistical analysis of the tests resulted in the extraction of nine significant factors. Six of the factors were achievement, adjustment, sex-typing factor for fears, mental ability, intolerance of ambiguity, and self-confidence. Three factors, used as measures of figural creativity, stood as independent traits: the ability to complete the unfinished, the ability to handle complexity, and preference for complexity. Therefore, it is concluded that figural creativity is not a unitary trait. As expected, traditional measures of intelligence and grades were independent of the figural creativity factors, although subjects were of better than average intelligence. Personality variables were independent of two creativity factors: the ability to complete the unfinished and preference for complexity. The third creativity factor, ability to handle complexity, was found in children who were perceptive, happy-go-lucky, and admitted that they had common fears. (DR)

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Figural Creativity, Intelligence, and Personality in Children: A Factor Analytic Study

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Despite the increased attention given in recent decades to the scientific investigation of phenomena subsumed under the construct, creativity, relatively little information on figural creativity in children has resulted. It is not definitely established that the aptitudes which seem to constitute creativity in adults are also to be found in children, nor that the personality characteristics related to creativity are similar for both adults and children. The present study was designed with those considerations in view. It was designed in an attempt to study the relationships among figural creativity, intelligence, and personality.

Much of the current literature on the topic of creativity reflects the notion that creativity is a unitary construct. However, some investigators have suggested that there are different types of creativity, and that creativity may be more or less specific to different areas (Guilford, 1963; Taylor, 1964; Burgart, 1961). Guilford has found evidence that creativity may be divided into the following contexts: figural, semantic, and symbolic. Figural creativity involves creative

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thinking in the visual arts. A study by Hollingsworth (1965) revealed that (1) figural creativity in sixth grade children does not stand as a functional unit, but consists of two independent traits: the ability to deal with complexity and the ability to take an unfinished structure and complete it. If the results of the earlier research could be partially validated, then more evidence would be amassed against the concept of a general creativity factor.

In attempting to isolate the 120 factors in the theoretical structure of the intellect, Guilford (1963) has listed the following intellectual characteristics as most likely to be valid indicators of figural creativity: fluency, flexibility, and originality. All of these characteristics fall into a class of factors known as productive-thinking abilities and into a subclass of divergent-thinking abilities, where creative abilities in the arts are found. Later work suggests that the product of "transformation" is inherent in creativity, in that it cuts across all context and process categories (Merrifield, 1966).

Some investigators have noted that school grades and intelligence tests are not very effective measures of creative potential (Taylor, 1964; Getzels and Jackson, 1962; Torrance, 1964; MacKinnon, 1962; Guilford, 1950; Stapp, 1963). Other researchers, however (Meer and Stein, 1955; Cicirelli, 1965; Olshin, 1963; Wallach and Kogan, 1964), have found significant

relationships between measures of intelligence and creativity. This serves to point out that the issue is not settled.

Certain personality traits have been found to characterize the creative adult. Although some researchers concur in their findings, others disagree leaving a state of confusion for anyone surveying the literature.

Barron (1963) has found the creative individual to prefer complexity. Also, MacKinnon (1962) has reported that creative people prefer perceptual complexity and likewise show complexity of personality. Creative people are more independent in their judgments than non-creative people according to the research of Barron (1963).

In one of the few studies done with children, Reid, King and Wickwire (1959) investigated cognitive and other personality characteristics of creative children. In contrast to studies which have shown creative adults to be more schizothymic (detached and cool) than their less creative counterparts, these investigators found that the creative children are cyclothymic (warmhearted and easy going). The study by Hollingsworth (1965) did not find a difference between creative and non-creative children on these personality scales.

Creative persons have been shown by Sarason (1960) and Reid et al. (1959) to be less anxious than the non-creatives. Englehardt and Hollingsworth (1965) did not find anxiety to be related to creativity.

The conception of figural creativity is represented by what independent measures of the trait hold in common. For that reason several measures of creativity were included in the study. It is hypothesized that the two independent creativity traits will again emerge in the analysis as discovered in earlier research. It is expected that the achievement and intelligence measures will be largely independent of the creativity measures. It is further expected that the personality variables of perceptiveness, sensitivity, complexity, and independence will be related to figural creativity.

Method

Subjects The subjects for the study were 196 fourth, fifth, and sixth grade children (103 boys and 93 girls ages 9 to 12) in the Forge Street Elementary School in Palmyra, Pennsylvania. The school is located in the residential section of a relatively small community.

Procedure A battery of fourteen tests was administered in one-hour testing periods to each grade separately. Each grade had three testing periods. The group tests were given by the same administrator without the teachers of the pupils being present.

During the first testing period the following tests were administered: Independence Test, Free Designs, Children's Interests, Sarbin Test, and Hidden Patterns. (The tests were given in the order in which they are listed. The testing order

was arranged so that a variety of tasks would be called for in each testing session.) In the second testing period one day later the following were given: Flexibility and Originality Tests, Children's Personality Questionnaire (CPQ), and Designs. One day after the second testing period the following were administered: Barron-Welsh Art Scale of the Welsh Figure Preference Test, Picture Completion subtest of the Wechsler Intelligence Scale for Children (WISC), Sarason General Anxiety Scale for Children, Production of Figural Effects Test, and Hidden Figures Test.

Teacher ratings of creativity and independence were obtained without the teachers' knowledge of the content of the test battery. Also collected were grade point averages for the previous year, art grades, IQ scores (California Test of Mental Maturity) and Iowa Achievement Test composite scores.

Results and Discussion

Statistical Analysis The first step of the statistical analysis involved the intercorrelation of the thirty variables across 196 subjects. The Pearson product-moment correlations were calculated on a Honeywell 2200 computer. The thirty variables were then factor analyzed. Nine factors were extracted by the principal components method using unit communalities. Nine factors were judged to be significant because the first nine eigenvalues were greater than or equal to 1.0. The nine factors were then rotated according to the varimax criterion.

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Interpretation of Factors Interpretation of factors will rest on loadings that have an absolute value of .30 or greater.

Factor A represents an achievement factor showing high loadings on achievement and grade in school. The older one becomes, the better he performs on measures of achievement. The appearance of Picture Completion, Hidden Patterns, the Sarbin Test, and Flexibility and Originality Tests suggest that an element of perceptiveness and social sensitivity may be involved in school achievement. Intelligence is also a part of this factor as shown by the appearance of the CPQ Intelligence scale.

Factor B can be interpreted as an adjustment factor. Children who are emotionally stable, warmhearted, venturesome, independent, and self-confident do not seem to be apprehensive, tense, or concerned about school. Cattell (1959) reports that ego strength involves emotional control. The child scoring high on this scale would not be over-anxious. The cyclothymic child is easy going and undisturbed by criticism. The venturesome individual is carefree and friendly. The child who scores high on the Independence Questionnaire would be one who manages his own affairs and who would be encouraged to structure his own life-plans. Independent children would seem to need confidence in themselves to avoid group influences.

Factor C is a sex-typing factor showing that girls admit to more fears and are more concerned about school than boys.

Boys on the other hand seem to "lie" about their fears (Sarason General Anxiety Scale for Children - Lie scale) and seem more happy-go-lucky than girls. According to Kagan (1964) girls are supposed to be "good" and do well in school. Boys are allowed to be "bad" and not very concerned about school work. It is "sissy" for boys to admit to fears, while girls are allowed to be afraid of more things.

Factor D can be interpreted as a mental ability factor with high loadings of grades, intelligence, and achievement measures. Factors D and A are similar in that the Iowa Achievement Test, Hidden Patterns test, and the CPQ Intelligence scale appear on both. However, on Factor A grade in school and the Iowa Achievement Test have the highest loadings. The tests loading on Factor A involved a concern with school achievement and doing well without necessarily getting good grades (IQ and grade point average did not appear). Factor D is clearly comprised of criteria related to intelligence, such as good grades and high IQ. That the teacher rating of creativity and independence had a high loading on Factor D may be due to the fact that teachers had difficulty differentiating among intelligence, creativity, and independence. There seemed to be a "halo effect" in operation during the rating of pupils. It is interesting to note that in the Hollingsworth (1965) study teacher ratings of creativity loaded on the intelligence factor. The rating form used in that study was simpler, but produced the same results. Holland (1959)

and Piers, et al. (1960) reported that teacher ratings are more useful as predictors of academic achievement than as predictors of creativity.

Factor E (Divergent Production of Figural Implications) is one of the creativity factors emerging in the analysis. The drawings (Free Designs) which were rated by art students, involved the production of pleasing designs from a stimulus. Flexibility and Originality Tests utilize basic structures which the children are then told to develop in different ways. The basic structure is elaborated through the creation of different designs. The Production of Figural Effects Test calls for the elaboration of a basic stimulus. The child adds to the basic lines and develops a design suggested to him by the stimulus. The major loadings of the art grades appeared on other factors; however, some portion of the art grade seemed to involve following the teacher's directions in order to arrive at a completed object.

Factor F is mainly determined by the Intolerance of Ambiguity Scale of Children's Interests. There is a slight indication that the child who is intolerant of ambiguity might also be concerned about school, but "lies" about general fears. This child could also make designs or construct things given a basic set of elements.

Factor G (Production of Figural Systems) is another creativity factor. The factor is led by the Hidden Figures Test, which involves finding a basic, simple figure in a complex one. The Designs Test calls for the creation of complex designs from a set of basic elements. A higher score

is given for complex systems. Anxiety and Surgency had low loadings on the factor. Cattell (1959) reports that surgent children are extroverts and have had a less punishing environment. These individuals would be able to admit to their fears and not find them crippling. They would not "lie" on the lie scale of the General Anxiety Scale, which had a low negative loading on the factor. Surgent individuals are also not threatened by complexity. The handling of complexity, as demonstrated by the tests, seems to be a perceptual ability or cognitive style. The creative person finds security in complexity, according to the research of Barron (1963).

Factor H (Preference for Complexity), another figural creativity factor, seems to be related in part to Factor G. Factor G involves an ability to deal with complexity while Factor H involves a preference for complexity. The Barron Welsh Art Scale measures preference for complexity in line drawings. The Designs Test appears on both Factors G and H. To draw complex designs would seem to be related to a preference for complexity.

Factor I is a self-confidence factor. It would seem that the child who is self-confident and tense does well in art. In art classes, the child must be able to go ahead on his own, do his own work, and tolerate the tension until the lesson has been completed. This child is also not very diligent. In other words, he is not very concerned about the consequences of his behavior.

Conclusion The extraction of Factors E, G, and H shows that figural creativity does not stand as a functional unit, but as independent traits: the ability to complete the unfinished, the ability to handle complexity, and preference for complexity. The creativity factors extracted in this study appear to be similar to the two factors of figural creativity found in the Hollingsworth (1965) study, results of which were cited previously. It would seem that the factors were not just an artifact of the particular tests and subjects.

The present study showed traditional measures of intelligence and grades to be independent of the figural creativity factors. This finding corroborates the results of the Hollingsworth study. However, since the subjects in both studies were of better than average intelligence, neither study contradicts the view of MacKinnon (1962) who feels that once a certain level of intelligence is reached, whether a person performs creatively or not is determined by other factors.

Personality variables were independent of two of the figural creativity factors: E (Divergent Production of Figural Implications) and H (Preference for Complexity). Anxiety and surgency had low loadings on Factor G (Production of Figural Systems). The child who would do well on the measures with high loadings on the factor would be perceptive, happy-go-lucky, and admit to common fears. Creative adults have been found to be open and perceptive, but not usually happy-go lucky.

The tests of Flexibility and Originality seem to have merit for further research, as do the ratings of the Free Designs. The exercises were originally proposed as measures of a unitary trait of "creativity." However, the results of the study have shown that one general factor cannot account for all that is measured by these tests.